REMARKS

Claims 1-33 and 55-64 have been withdrawn as being directed to a non-elected invention. Claim 54 has been canceled herein.

1. Claims 34, 35 and 37-54 were rejected under §102(a) over Otsuki. This rejection is respectfully traversed for the following reasons.

The claimed invention is drawn to a coated article, as well as a semiconductor processing tool. According to claim 34, the coated article calls for a substrate and a coating directly contacting and overlying the substrate. The coating has a thickness greater than about 10 microns, and consists essentially of a garnet crystal structure. The substrate and the coating have a thermal expansion mismatch of at least about 30%, as recited. The present invention provides coated articles and semiconductor processing components having particularly robust performance in use, by combining a substrate and a garnet crystal structure coating, such as yttria alumina garnet (YAG). While prior attempts at forming such garnet coatings on substrates having a thermal expansion coefficient mismatch have been attempted, such techniques typically rely on intermediate layers, and/or are limited to very thin layers having inadequate corrosion protection. As described in the present specification, Applicants have been successful in creating components in which a relatively thick garnet coating is directly deposited on a substrate having a substantial thermal expansion mismatch. For example, such embodiments have been made by directly thermally spraying a garnet crystal structure powder onto a substrate, rather than relying upon various feedstock powders such as alumina and yttria in an attempt to form YAG in the final coating. As described in the present specification, it is believed that successful formation of YAG coatings in the as-formed state may be due to residual YAG crystallites present during thermal spraying under particular conditions, providing for nucleation and growth sites such that substantially the entirety of the film is formed of YAG.

Turning to the disclosure of Otsuki, description is provided of utilizing Al_2O_3/Y_2O_3 YAG powder having 99.9% purity. See FIG. 3, as well as page 4, paragraph 62. However, the sprayed coating utilizing this YAG powder is amorphous, and does not consist essentially of garnet. Please see paragraph 66 and FIG. 9. As shown in FIG. 9, the deposited coating was principally amorphous (about 80%), the diffraction pattern indicating a YAG content of only about 20%.

In contrast, the claimed invention calls for coating consisting essentially of garnet crystal structure. Applicants submit that Otsuki nowhere discloses or even remotely suggests such a coating, and indeed, Otsuki's own data teaches that the coating is approximately 80% amorphous.

Applicants respectfully submit that all features of the presently claimed invention are not disclosed (or even remotely suggested). Accordingly, withdrawal of the §102 rejection over Otsuki is respectfully requested.

2. Claims 34, 39, 41, 43-52, and 54 were rejected under §102 over JP '985. This rejection is respectfully traversed for the following reasons.

JP '985 appears to disclose a layered structure including an aluminum nitride substrate, an intermediate layer, and a YAG topcoat. In contrast, the claimed invention calls for a garnet crystal structure coating directly contacting and overlying the substrate, wherein the substrate and the coating have a thermal expansion mismatch of at least 30%. In reference to JP '985, the YAG coating is not directly applied to the alumina nitride substrate, but rather an intermediate layer having a more closely matched thermal expansion coefficient. In addition, JP '985, to the extent reviewable by Applicants, does not disclose a coating consisting essentially of the garnet crystal structure.

Since JP '985 fails to disclose (or even remotely suggest) all features of the claimed invention, withdrawal of the §102 rejection is respectfully requested.

3. Claims 34-36, 38, and 43-45 were rejected under §102(b) over Vance et al. This rejection is respectfully traversed for the following reasons.

The disclosure of Vance et al. is directed to a complex multi-layered thermal barrier coating for utilization on superalloys. As disclosed, FIG. 1 depicts a metal substrate 6, typically an Ni or Co-based superalloy followed by a metallic bond coat (typically MCrAlY), a thermally grown oxide layer 4, a stabilized zirconia layer 3, a thermal expansion coefficient matching layer 2, and finally, a YAG layer 1. Clearly, Vance et al. fail to disclose or even remotely suggest a coating directly contacting and overlying a substrate having a thermal expansion mismatch as claimed. Accordingly, withdrawal or the §102 rejection of Vance et al. is respectfully requested.

4. Claims 34, 39, 41-47, and 54 were rejected under §102(e) over Morita et al. This rejection is respectfully traversed for the following reasons.

Morita et al. disclose a structure in which YAG is reported to have been thermally grown from an alumina substrate. Morita et al. fail to disclose or even remotely suggest a coating provided on a substrate having a thermal expansion mismatch as claimed. In this regard, it is noted that the disclosed alumina/YAG combination has a thermal expansion mismatch of about 4%. Accordingly, withdrawal of the §102 rejection over Morita et al. is respectfully requested.

5. Claims 34, 35, 39, 43-46, and 54 were rejected under §103 over JP '628. This rejection is respectfully traversed for the following reasons.

JP '628 is directed to a semiconductor device having an aluminum nitride surface apparently coated with a YAG thin film layer to suppress current leakage between electrical contacts or leads. As described above and in paragraph 1004 of the present specification, thin films of YAG may be deposited on substrates having a substantial thermal expansion mismatch. However, as thick layers of YAG are provided, the thermal expansion mismatch generally causes cracking and failure of the part. JP '628 corresponds to this state of the art, and is limited to thin films. There is nothing contained within the disclosure of this reference to suggest modifying the layer to have a substantial thickness, greater than about 10 microns. Indeed, this reference fails to teach or enable such thick coatings. In this regard, the coating provided in JP '628 is provided for electrical insulation, and as such, a thick film would not have been utilized in the JP '628 structure.

Applicants respectfully submit that all features of the presently claimed invention are not disclosed nor even remotely suggested by JP '628. Accordingly, withdrawal of the §103 rejection over this reference is respectfully requested.

6. Claims 34, 39, 41-47, and 54 were rejected under JP '364. This rejection is respectfully traversed for the following reasons.

JP '364 appears to disclose a ceramic sintered substrate, having a melt-coated YAG coating thereon. However, as described in the text of JP '364, the coating is relatively thin. JP '364 does not teach coatings having a thickness greater than 10 microns. Furthermore, JP '364 fails to disclose or even remotely suggest formation of a YAG coating on substrate having a thermal expansion mismatch as claimed . It would appear that JP '364 utilizes an alumina substrate, which does not meet the thermal expansion mismatch requirement of the present claims. Accordingly, reconsideration and withdrawal of the §103 rejection of JP '364 are respectfully requested.

7. Claims 34-38 were rejected under §103 over Padture et al. Applicants respectfully traverse this rejection for the following reasons.

The disclosure of Padture et al. is directed to a "systematized procedure for the identification of novel ceramic oxides suitable for use as TBCs". See column 2, lines 58-60. Padture et al. go on to disclose that YAG may be a suitable coating for turbine applications utilizing superalloys, as a potential replacement material for zirconia. Padture et al. disclose that YAG has a thermal expansion coefficient greater than that of zirconia and that it is important to match the thermal expansion coefficient of the coating with the underlying superalloy substrate. See column 5, lines 43-48, as well as claim 1, column 8, line 66-column 9, line 1. Further, Padture et al. disclose that various techniques, such as thermal spraying, may be utilized and that an optional metallic bond coat may be provided between the substrate and the YAG coating.

However, Applicants respectfully submit that Padture et al. do not even remotely enable the combination of a thick YAG coating provided on a substrate having a substantial thermal expansion mismatch. Padture et al. disclose no working embodiments. The disclosure of Padture et al. is largely prophetic and is limited to a technology overview of various materials that might be utilized in TBC applications. Indeed, looking to the embodiments, Padture et al. disclose that their work was simply limited to purchase of an off-the-shelf 99% dense YAG disk formed by hot pressing, and subjecting that disk to characterization tests. See column 6, lines 52-column 8, line 33. This reference fails to meet the requirements of enablement to provide a suitable prior art reference over which a proper §103 rejection can be made with respect to the claimed invention that calls for a substrate and a garnet coating thereon, having a 30% thermal expansion mismatch. See M.P.E.P. §2121.01. Clearly, Padture et al. nowhere disclose or even remotely suggest some of the various features described in the present specification that enable formation of coating consisting essentially of a garnet crystal structure on a substrate having a substantial thermal expansion mismatch. Such features include, for example, use of a YAG powder, rather than alumina and yttria powders, thermal spraying under conditions which are believed to leave YAG nucleation and growth sites in the as-deposited film.

For at least the foregoing reasons, reconsideration and withdrawal of the §103 rejection over Padture et al. are respectfully requested.

8. Claim 36 was rejected under §103(a) over Otsuki. Applicants submit that the deficiencies of Otsuki have been pointed out above. Accordingly, withdrawal of this §103 rejection is respectfully requested.

Applicants respectfully submit that the present application is now in condition for allowance. Accordingly, the Examiner is requested to issue a Notice of Allowance for all pending claims.

Should the Examiner deem that any further action by the Applicants would be desirable for placing this application in even better condition for issue, the Examiner is request to telephone Applicants' undersigned attorney at the number listed below.

The Commissioner is hereby authorized to charge any fees that may be required, or credit any overpayment, to Deposit Account Number 50-2469.

Respectfully submitted,

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Date

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